REMARKS

Claim Rejections – 35 U.S.C. §103

Claims 62-82 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamazaki et al. (US 6,001,432) in view of Anthony et al. (US 5,523,121). Applicant respectfully disagrees with Examiner's contentions.

For a §103 obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. MPEP 2143.

Claim 62

Claim 62 teaches a method for cooling a semiconductor device having a thermal transfer surface area comprising "growing a diamond film on a substrate in a deposition chamber by reacting gases suitable for diamond deposition in plasma ignited in said deposition chamber, said plasma disposed adjacent to a growth surface of said substrate such that said plasma extends no further than about 5 mm from said growth surface of said substrate"

Yamazaki does not teach plasma being disposed on the surface of the substrate on which the diamond film is to be grown such that the extent of the plasma is limited to not more than 5 mm from the substrate. Instead, Yamazaki teaches a type of diamond CVD using remote plasma deposition in which plasmas are formed on an electrode *opposite* the surface on which a diamond film is to be formed. It does not teach the immersion of the substrate in the plasma, as taught by the present invention.

Yamazaki also does not teach "removing said diamond film from said substrate" as taught in Claim 62 of the present invention.

On Page 2 of the Office Action dated April 26, 2004, Examiner even admits that Yamazaki teaches "the claimed subject matter except for showing the plasma as a localized one that is no more than 5 mm from the film surface and subsequently removing the film from the substrate."

Examiner asserts that Anthony teaches the localized plasma limitation of the present invention. However, Anthony does not use plasma deposition at all. Instead, Anthony's deposition technology depends on heated filaments, which affect diamond deposition by purely thermal means. Anthony teaches a process whereby the reactive gas is passed "over a hot filament at a conventional temperature, preferably in the range of 1700° - 2400° C." (Col. 6, lines 54-55). This is so-called "equilibrium chemistry", because the composition of the gases can be completely predicted using classical thermodynamics of temperature and laws of chemistry.

The present invention employs electrically-generated plasma, which operates to cause diamond deposition through activation of gases according to effects that cannot be

generated through thermal means. This is so-called "non-equilibrium chemistry". Page 13 of the specification elaborates on the deficiencies of heated filaments, stating, "diamond CVD practiced with heated filaments suffers from relative inefficiency of atomic hydrogen production (due to limits on filament temperature) as well as losses due to the inability to locate filaments in immediate proximity to the deposition surface, which limitation arises from substrate overheating due to radiation of energy from the filament."

Not only does Anthony, which uses a heated filament, teach a principle of operation different from the present invention, which uses plasma deposition, but it also teaches a different principle of operation from Yamazaki. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. MPEP 2143.02. Since Yamazaki teaches plasma deposition, combining Anthony with Yamazaki would change the principle of operation of Yamazaki from plasma deposition to a heated filament. Therefore, the teachings of Yamazaki and Anthony are not sufficient to render the claims prima facie obvious.

Additionally, the present invention teaches the immersion of the substrate within the excitation region. In contrast, Anthony teaches placement of the gas excitation means, the heated filament, remote from the substrate, explaining that the "distance from the filament to substrate generally is of the order of about 0.2-2 cm." (Col. 7, lines 48-50).

Furthermore, although Anthony refers to its resulting material as diamond film, it does not teach the growing of the same diamond material taught in the present invention.

Anthony states that the resulting material "does not have Raman signature at 1332 cm^{-1}." (Col. 4, lines 64-65). It also describes the material in an example, stating, "Raman spectra of sample diamond coating shows no signature line at 1332 cm^{-1}" (Col. 8, lines 44-45).

As would be appreciated by anyone with ordinary skill in the art, a Raman signature at 1332 cm^{-1} is diagnostic of diamond material that is suitable for heat spreaders because of the well-known diminution of thermal conductivity with grain (facet or crystallite) size in CVD diamond. As with other materials in which heat is propagated through phonon conduction, small grains scatter phonons (thereby impeding heat conduction) and suppress the mechanisms that give rise to Raman emissions diagnostic of diamond. From both characterization and functional perspectives, Anthony produces material that is graphitic and is better described as diamond-like carbon or amorphous carbon. It is well known in the art that neither diamond-like carbon nor amorphous graphite exhibit thermal conductivity sufficient to allow their use as a thermal control or heat transfer component as in the present invention. Therefore, Anthony does not teach the growing of the same "diamond film" as taught by Claim 62 of the present invention.

Since Anthony fails to teach plasma deposition, immersion of the substrate region within the excitation region, and the diamond film taught in Claim 62 of the present invention, there is clearly no suggestion or incentive that would have motivated the skilled artisan to modify or combine Yamazaki and Anthony to arrive at the present invention. Applicant respectfully submits that Yamakazi and Anthony fail to teach all

elements of Claim 62. Claim 62 is currently in condition for allowance. Reconsideration and withdrawal of the rejection is respectfully requested.

Claims 63-68

Since Claims 63-68 are dependent from Claim 62, Applicant respectfully asserts that Claims 63-68 are also patentable as they contain the same limitations as Claim 62.

Furthermore, Claim 64 of the present invention teaches "thermally coupling a second surface of said diamond film to a heat sink." Examiner neither maintains, nor did Applicant find within Yamazaki, thermally coupling the diamond film to a heat sink. Although Anthony does mention heat sinks as a potential use for diamond films in the background, it fails to teach how to employ diamond films for such an application. Also, as mentioned above, the resulting material in Anthony is not a true diamond material and is not sufficient for use as a thermal control or heat transfer component. Therefore, It would not have been obvious to couple the resulting film to a heat sink.

Reconsideration and withdrawal of this rejection is respectfully requested.

Claim 69

The same arguments made with respect to the patentability of Claim 62 above are applicable to the patentability of Claim 69 as well.

Additionally, Claim 69 teaches growing a diamond film that is "characterized by a growth efficiency greater than about 0.003". Examiner neither maintains, nor did Applicant find within Yamazaki and Anthony, growing a diamond film characterized by a

growth efficiency greater than about 0.003. In fact, Applicant did not find any reference in the prior art to growth efficiency at all. Neither Yamazaki nor Anthony teaches this limitation of Claim 69.

Applicant respectfully submits that Claim 69 is currently in condition for allowance. Reconsideration and withdrawal of this rejection is respectfully requested.

Claims 70-75

Since Claims 70-75 are dependent from Claim 69, Applicant respectfully asserts that Claims 70-75 are also patentable as they contain the same limitations as Claim 69.

Furthermore, the same arguments made above with respect to the heat sink of Claim 64 are applicable to Claim 71 as well.

Reconsideration and withdrawal of this rejection is respectfully requested.

Claim 76

The same arguments made with respect to the patentability of Claim 62 above are applicable to the patentability of Claim 76 as well.

Applicant respectfully submits that Claim 76 is currently in condition for allowance. Reconsideration and withdrawal of this rejection is respectfully requested.

Claims 77-82

Since Claims 77-82 are dependent from Claim 76, Applicant respectfully asserts that Claims 77-82 are also patentable as they contain the same limitations as Claim 76.

Furthermore, the same arguments made above with respect to the heat sink of Claim 64 are applicable to Claim 78 as well.

Reconsideration and withdrawal of this rejection is respectfully requested.

If the Examiner has any questions regarding this application, the Examiner may telephone the undersigned at 775-586-9500.

Respectfully submitted,
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Dated: October 26, 2004



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